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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/566,270	01/30/2006	Tsutomu Fukuda	285291US0PCT	1695

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EXAMINER	
LI, JUN	

ART UNIT	PAPER NUMBER
4181	

NOTIFICATION DATE	DELIVERY MODE
12/11/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/566,270	FUKUDA ET AL.	
	Examiner	Art Unit	
	JUN LI	4181	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) *2,3 and 7-11* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *05/17/2007,04/10/2006,01/30/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's election **without** traverse of group **I** invention with species aluminum magnesium titanate in the reply filed on 11/12/2008 is acknowledged.

Therefore**, the restriction requirement is maintained, and made FINAL.**

2. Claims 2-3 and 7-11 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected group of invention and a nonelected species aluminum titanate, there being no allowable generic or linking claim. Claims 1 and 4-6 are presented for examination on the merit.

Specification

Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. In the instant case, the abstract exceeds the maximum 150 words. Appropriate correction is required. See MPEP § 608.01(b).

Claim Objections

3. Claim 5 and 6 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim 5 and 6. See MPEP § 608.01(n). Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claim 1, 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono (US4483940) in view of Giordano et al (Journal of the European Ceramic Society 2002, 22:1811-1822) and Fukuda et al (JP 2002-145659).

Ono teaches a honeycomb carrier supporting a honeycomb catalyst for usage in internal combustion engines including treating exhaust gases (abstract, column 1 lines 24-26), wherein the honeycomb carrier can be any of the ceramic honeycomb carrier including aluminum titanate magnesia (column 8 lines 39-45).

Regarding claim 1, Ono fails to specifically teach the component of the honeycomb carrier is a sintered product containing Mg, Al, Ti containing compound with an empirical formula $Mg_xAl_{2(1-x)}Ti_{(1+x)}O_5$ with addition of alkali feldspar represented by $(Na_yK_{1-y})AlSi_3O_8$ (wherein $0 \leq y \leq 1$).

Giordano teaches sintered product aluminum magnesium titanate $Mg_{0.1}Al_{1.8}Ti_{1.1}O_5$ and $Mg_{0.5}AlTi_{1.5}O_5$ which reads on the recited limitation of Mg, Al, Ti containing compound with an empirical formula $Mg_xAl_{2(1-x)}Ti_{(1+x)}O_5$(abstract). Giordano further teaches that addition of magnesium compound can help improve the thermodynamic instability of aluminum titante (Al_2TiO_5) at high temperature (page 1812 left column second paragraph lines 12-16).

Fukuda teaches using 1-15 parts by weight of alkali feldspar ($(Na_xK_{1-x})AlSi_3O_8$, $0 \leq x \leq 1$) to increase the mechanical strength and stability of aluminum titanate based sintered compact at 1400-1700 ºC (abstract, machine translated detailed description page 3 paragraph [0012]). Fukuda further teaches that the adding the alkali feldspar can control the grain growth of the sintered compact (machine translated detailed description page 3 paragraph [0014]), achieve a high mechanical strength, low thermal expansion and a stabilizing crystal structure (machine translated detailed description page 5 paragraph [0025]).

It would have been obvious to one ordinary skill in the art at the time of invention filed to adopt the alkali feldspar of Fukuda to improve the sintered product of aluminum magnesium titanate, a magnesium modified aluminum titanate as indicated by Giordano (page 1812 left column second paragraph lines 12-19), to improve the honeycomb carrier for supporting honeycomb catalyst for exhaust gas cleaning. One ordinary skill in the art would have been motivated to do so because the addition of alkali feldspar can improve the mechanical strength, corrosion resistance of the improved thermodynamic stability of the aluminum magnesium titanate of Giordano for future

intended uses including internal combustion engines such as automobiles for treating their exhaust gases and depriving them of air pollutants such as nitrogen oxides, carbon monoxides as indicated by Ono (column 1 lines 24-27) and Fukuda (machine translated detailed description page 5 paragraph [0025],[0026]).

Regarding claims 5 and 6, Ono teaches using an alkali metal cerium (Ce) (Example 16, column 13 lines 61-62, Example 18, column 14 line 44) to remove nitrogen oxides NO_x from combustion gas burned in a cylindrical combustion apparatus where an air-methane mixed gas containing 3% methane was introduced into and burned (column 17 lines 14-22). The corresponding catalyst activity for removing NO is shown in Table 6 (column 17-18).

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ono (US4483940) in view of Giordano et al (Journal of the European Ceramic Society 2002, 22:1811-1822) and Fukuda et al (JP 2002-145659) as applied to claim 1 above, and further in view of Noda (US2001/0056034).

Regarding claim 4, the combined references have been described as above.

Ono further teaches that the cell density of the honeycomb carrier is 300cells/square inch (equals to 46.15 cells/cm^2), reading to the recited limitation of cell density within 15-124cells/ cm^2). Ono also teaches that the thermal expansion of the aluminum titanate magnesium is less than $0.3X10^{-6}\ K^{-1}$, which overlaps with the thermal expansion coefficient of the instant claim. MPEP clearly states that in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. See MPEP §2144.05 [R5]. It is also noted that the thermal

expansion coefficient is a determined physical property with a compound from chosen materials. Since the honeycomb carrier material is an obvious modification over prior art, its associated thermal expansion coefficient is also expected within similar range as disclosed in the instant application.

The combined references fail to expressly teach that the honeycomb carrier has a wall thickness from 0.05-0.6mm, and the porosity of the partition wall is 20-50%.

Noda teaches that the honeycomb carrier made from aluminum titante with addition of Mg can have a porosity of 5-50%, preferably 10-40% (page 2 paragraph [0014]), which reads to the recited limitation of porosity of 20-50% in the instant claim 4. Noda indicates that probably porosity is needed to maintain probable honeycomb carrier strength and suppresses the diffusion of alkali metal or alkaline earth metal catalyst into the carrier ((page 2 paragraph [0014]). Noda further teaches that a wall thickness of 0.05-0.1mm with a cell density 62-139.5 cells/cm^2(page 2 paragraph [0023]), reading into the recited limitation of the partition wall thickness of 0.05-0.6mm and cell density 15-124 cells/cm^2 in the instant claims. Noda also indicates that probable porosity and cell density can ensure good cell structure of honeycomb carrier with good bending strength and thermal expansion coefficient (less than $3.0X10^{-6}$ K^{-1}) for effectively purifying NO_x from exhaust gas (page 3 table 1, paragraph [0028]).

It would have been obvious to one ordinary skill in the art at the time of the invention filed to adopt the porosity and cell density of Noda to improve the honeycomb carrier structure of the combined references. One ordinary skill in the art would have been motivated to do so because probable porosity and cell density can ensure good

cell structure of honeycomb carrier with good bending strength and thermal expansion coefficient to effectively purify NO_x from exhaust gas (page 3 table 1, paragraph [0028]) and probable porosity can well suppresses alkali metal or alkaline earth metal catalyst into the carrier to ensure the durability of the catalyst (page 2 paragraph [0014] and page 3 paragraph [0029] lines 5-12).

6. Claim 1 and 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Noda (US2001/0056034)in view of Giordano et al (Journal of the European Ceramic Society 2002, 22:1811-1822) and Fukuda et al (JP 2002-145659).

Noda teaches a honeycomb carrier containing an material containing aluminum titante, preferably with addition of magnesium to suppress thermal decomposition at high temperature (page 2 left column lines 2-5), a catalyst layer including an alkali metal and/or an alkaline earth metal as an NO_x-adsorbing component for purification of exhaust gas.

Regarding claim 1, Noda fails to specifically teach the component of the honeycomb carrier is a sintered product containing Mg, Al, Ti containing compound with an empirical formula $Mg_xAl_{2(1-x)}Ti_{(1+x)}O_5$ with addition of alkali feldspar represented by $(Na_yK_{1-y})AlSi_3O_8$ (wherein $0 \leq y \leq 1$).

Giordano teaches sintered product aluminum magnesium titanate $Mg_{0.1}Al_{1.8}Ti_{1.1}O_5$ and $Mg_{0.5}AlTi_{1.5}O_5$ read into the recited limitation of Mg, Al, Ti containing compound with an empirical formula $Mg_xAl_{2(1-x)}Ti_{(1+x)}O_5$(abstract). Giordano further teaches that addition of magnesium compound can help improve the thermodynamic

instability of aluminum titante (Al_2TiO_5) at high temperature (page 1812 left column second paragraph lines 12-16).

Fukuda teaches using 1-15 parts by weight of alkali feldspar ($(Na_xK_{1-x})AlSi_3O_8$, $0 \leq x \leq 1$) to increase the mechanical strength and stability of aluminum titanate based sintered compact at 1400-1700 ºC (abstract, machine translated detailed description page 3 paragraph [0012]). Fukuda further teaches that the adding the alkali feldspar can control the grain growth of the sintered compact (machine translated detailed description page 3 paragraph [0014]), achieve a high mechanical strength, low thermal expansion and a stabilizing crystal structure (machine translated detailed description page 5 paragraph [0025]).

It would have been obvious to one ordinary skill in the art at the time of invention filed to adopt the alkali feldspar of Fukuda to improve the sintered product of aluminum magnesium titanate, a magnesium enhanced aluminum titanate as indicated by Giordano (page 1812 left column second paragraph lines 12-19) and Noda (page 2 left column lines2-5), to improve the honeycomb carrier for supporting honeycomb catalyst for exhaust gas cleaning. One ordinary skill in the art would have been motivated to do so because the addition of alkali feldspar can improve the mechanical strength, corrosion resistance of the improved thermodynamic stability of the aluminum magnesium titanate of Giordano for future intended uses including internal combustion engines such as automobiles for treating their exhaust gases and depriving them of air pollutants such as nitrogen oxides as indicated by Noda (abstract) and Fukuda (machine translated detailed description page 5 paragraph [0025],[0026]).

Regarding claim 4-6, Noda further teaches the honeycomb carrier has a porosity of 5-50%, more preferably 10-40% (page 3 paragraph [0014]), a thermal expansion coefficient preferably at $2.0X10^{-6}$ K^{-1} (page 3 table 1, paragraph [0028]), a partition wall thickness of 0.05-0.1mm with a cell density 62-139.5 cells/cm^2(page 3 paragraph [0028], table 1). Noda also teaches that the exhaust gases for NO_x purification are from lean burn engines, direct injection engines etc, wherein fuel diluted and burned is an expected characteristic.

Conclusion

1. All the claims are rejected for the reasons of the record.

2. The additional references on the 892 have been cited as art of interest since they are cumulative to or less than the art relied upon in the rejections above.

3. The additional references cited on the 1449 have been reviewed by the examiner and are considered to be art of interest since they are cumulative to or less than the art relied upon in the above rejections.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JUN LI whose telephone number is (571)270-5858. The examiner can normally be reached on Monday-Friday, 8:00am EST-5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vickie Kim can be reached on 571-272-0579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JUN LI/

Examiner, Art Unit 4181

/Vickie Kim/
Supervisory Patent Examiner, Art Unit 4181